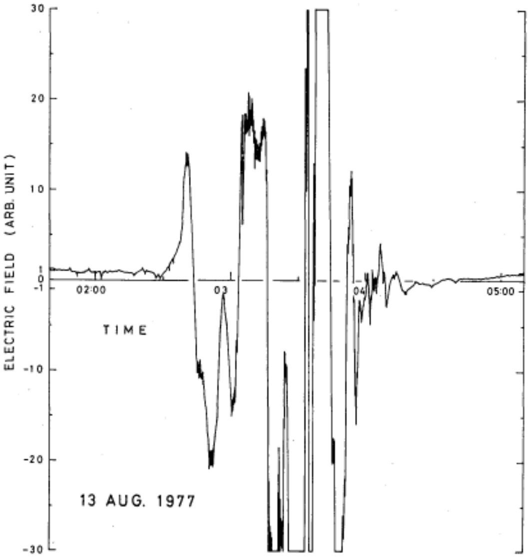

Fig. 12 Disturbances of the atmospheric electric field on August 13, 1977, caused by thunderstorm.

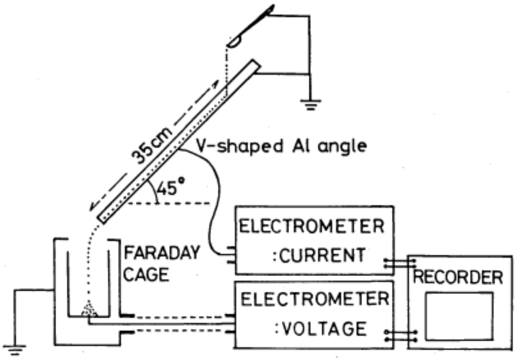

Fig. 13 Schematic figure of the laboratory experiments.

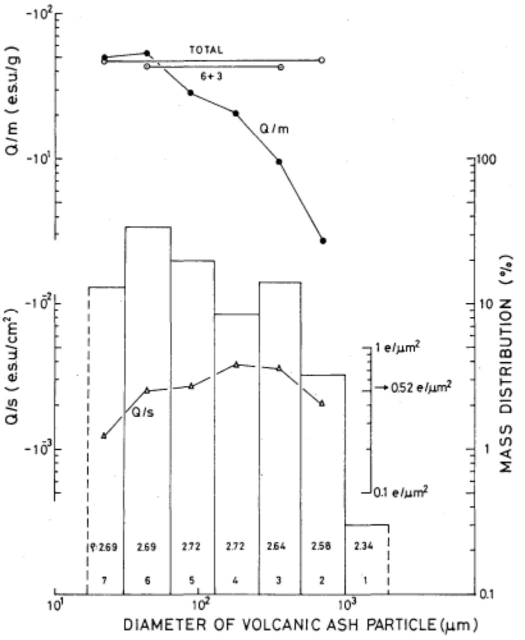

Fig. 14 Results of the laboratory experiments.

between volcanic ash particles at Mt. Aso and Mt. Asama. Stow (1970) made an experiment of frictional electrification between cylindrical nozzles made of different selected materials and different sand samples and he concluded that generally the sand particles were charged negatively.

During the volcanic eruption from the midnight of August 13 to the next early morning, we collected falling volcanic ash particles directly into large vinyl bags to make frictional experiments and brought the trapped samples back to our laboratory.

4.1 *Preliminary frictional experiments using volcanic ash particles*

Frictional experiments were carried out using the arrangement as shown in Fig. 13 except for electric current. Volcanic ash particles filled a spoon which was supported in the upper part of the arrangement fell on a V-shaped angle aluminum trough and they slid down and caused friction with the angled aluminum trough of a length of 35 cm. After that the particles fell into a Faraday cage connected to a vibrating reed electrometer, and the static electricity produced was recorded. Results obtained are summarized in Fig. 14. Volcanic ash particles were divided into seven groups from about 10 μm to 1,000 μm in diameter. The size distribution of these groups had a tendency to show peaks at about 50 μm of the group 6 and at about 500 μm of group 3. On the other hand, the density of these particles was in a range between 2.5 $g \cdot cm^{-3}$ and 2.7 $g \cdot cm^{-3}$ except for group 1 of 2.34 $g \cdot cm^{-3}$. Showing as a charge per unit area (Q/S) to charge produced during friction in every group, the range of charge produced was between -4×10^{-3} and -1×10^{-3} $esu \cdot cm^{-2}$ as shown by white triangles except for group 1. It was impossible to make the experiment because of the sample volume of group 1 was very small. On the other hand, showing as a charge per unit mass (Q/m) to charge produced during friction in every group, the range of